Alberta Geological Survey

# Rock Chips

Winter 2011

## Oil Sands Surveillance and Monitoring Project

The Oil Sands Surveillance and Monitoring Project is piloting the use of Earth Observation (EO) technologies to evaluate their potential application as tools to aid in energy industry regulation in Alberta. Alberta Geological Survey (AGS) is collaborating with the Canadian Centre for Remote Sensing (CCRS) and the Canadian Space Agency (CSA) to evaluate the use of satellite technologies within the regulatory bodies of the Government of Alberta. Since 2005, Alberta Geological Survey and CCRS have been working on the use of interferometric radar to monitor landslides. Late in 2009, AGS approached CCRS and CSA with the goal of cooperating to develop the use of satellite technology for other energy sector applications. Our first step was to invite government scientists working with EO technologies, provincial regulators, and academics to a workshop held at the end of February 2011. The workshop's goal was to identify technologies that would enable regulators to improve their decision-making process.

Using the workshop results, five pilot projects were identified by a committee of regulators:

1. Reclamation Performance Tracking
2. Air Quality Monitoring
3. Anthropogenic Change Detection
4. Surface Deformation Mapping
5. Wet Area Mapping

Each of these pilot projects is directed by one of three Alberta energy sector regulators: Alberta Environment and Water (AEW), Energy Resources Conservation Board (ERCB), and Sustainable Resource Development (SRD). All of the pilot projects have a scientific advisory board composed of experts from government and academia. Our goal is to complete all pilot projects by March 2013.

Coherence diagram constructed from RADARSAT-2 data collected July 15, 2008 and August 8, 2008. Yellows indicate high coherence and blues indicate low coherence. Coherence serves as a measure of quality of an interferogram and can tell you about the surface type (vegetation, water, and rock). Much of the image that indicates high coherence is the result of recent precipitation. The scale of this image is 18.5 km x 23 km.

### Reclamation Performance Tracking and Air Quality Monitoring

Alberta Environment and Water is working with the

ERCB Energy Resources Conservation Board | AGS Alberta Geological Survey

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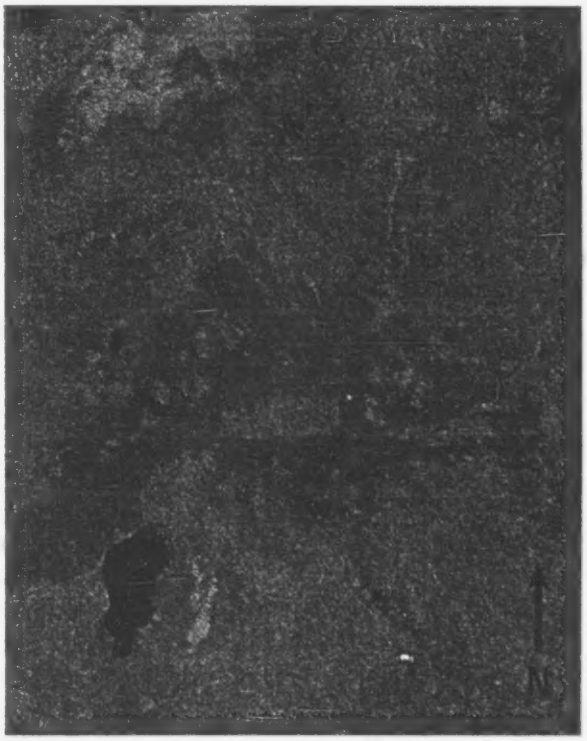

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**Reclamation Performance Tracking and Air Quality Monitoring**

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University of Lethbridge and A-MAPS Environmental Inc. on two pilot projects: Reclamation Performance Tracking and Air Quality Monitoring.

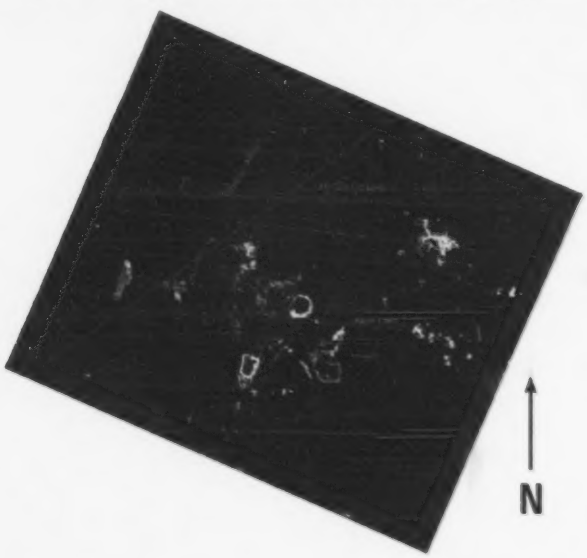
The Reclamation Performance Tracking project uses multi-spectral images to assess the condition of reclaimed wellpad clearings by comparing it to adjacent lands. Alberta Environment and Water will use this information as a management tool to direct field assessments in the most effective manner.

Air-quality monitoring technologies are still being refined. This project will test and validate the methodology used by A-MAPS Environmental Inc. with ambient data generated from monitoring stations.

**Anthropogenic Change Detection and Surface Deformation**

The ERCB is working directly with CCRS on the Anthropogenic Change Detection and Surface Deformation pilot projects. Two sites were chosen for each of these pilot projects in consultation with the ERCB Oil Sands and Coal Branch.

The selected sites for the Anthropogenic Change Detection pilot project are in the open-pit mining and in situ extraction areas in the lower Athabasca region. This project's goal is to identify anthropogenic change over time using multi-spectral, optical imagery of various resolutions. Since change detection is a well-established technology, we will concentrate on defining which toolsets and approaches will work best for our purposes.




SPOT-5 10 m multi-spectral image collected over the mineable oil sands projects (collected October 5, 2010.) Scale is 70 km x 60 km.

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Comments and suggestions for Rock Chips may be sent to Maryanne Protz at maryanne.protz@ercb.ca

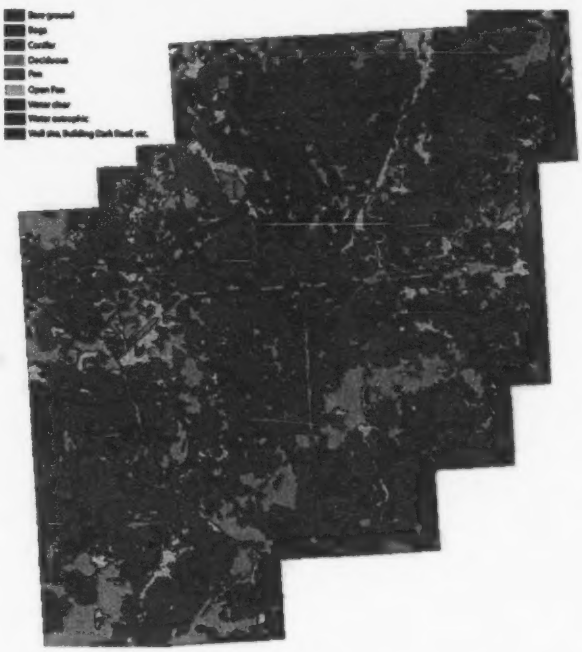
By comparing two images over time, a minimal level of change-detection analysis can be used to identify areas of change (shown in red).

The Surface Deformation pilot project is examining two regions of in situ extraction: lower Athabasca (steam-assisted gravity drainage) and Cold Lake (cyclic steam stimulation). The goal of this project is to investigate the capabilities of interferometric synthetic aperture radar to measure regional and local surface deformation related to steam injection-assisted extraction of bitumen and heavy oils.

**Wet Area Mapping**

Sustainable Resource Development is working with CCRS on the Wet Area Mapping pilot project to augment its fire prediction modelling.

The project uses polarimetric synthetic aperture radar data to discern between bogs and fens. This information will allow SRD to include natural fire breaks into its predictive modelling and to direct resources to target vulnerable areas. The site for testing the polarimetric wetland classification was selected using available RADARSAT 2 and ALOS data, with two sets of classification developed by Ducks Unlimited and University of Alberta researchers. Polarimetric wetlands classification can be done inexpensively and can effectively track change over time.



A more advanced stage of analysis characterizes the type of change that has occurred by grouping similar pixels into polygons. The polygons are then classified using ground truthing and input from experts with knowledge of the region (not the same area as the previous diagram).

Earth observation technologies allow for effective management of large areas of land by identifying and tracking regional change. Using EO technologies, these trends not only allow for change over time to be quantified but also for anomalies to be identified for site-specific diagnosis and inspection. ❖

# In Memoriam: Andre Lytviak

It is with great sadness that we learned of the passing of Andre Lytviak on Tuesday, November 29, after a battle with cancer. Our deepest and most sincere condolences go out to his wife and two sons. In lieu of flowers, they have requested that donations be made to the Cross Cancer Institute in Andre's name.

Andre was born in a refugee camp in Germany after the Second World War. He and his parents immigrated to Canada before he was a year old, and they all became Canadian citizens together. After living in Winnipeg, Manitoba, and Exshaw, Alberta, Andre and his family settled in Edmonton.

Andre joined the Alberta Research Council (ARC) in 1970 working as a groundwater technician in the first systematic, provincial groundwater-mapping program in Canada. While working at the ARC, he completed his B.Sc. in geology and mathematics at the University of Alberta and acquired his private pilot licence. Using his pilot licence to conduct aerial reconnaissance, Andre travelled to many of Alberta's most remote regions while working on the groundwater program.

His curious and analytical mind led him to look for

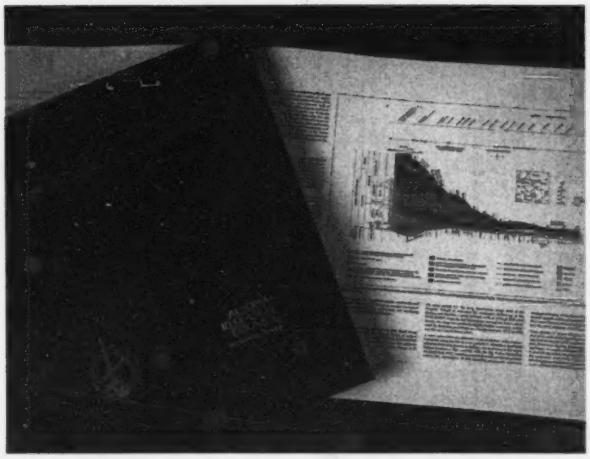
Andre during the 1976 field season.

Andre working on one of the Basin Analysis Group projects in 1987.

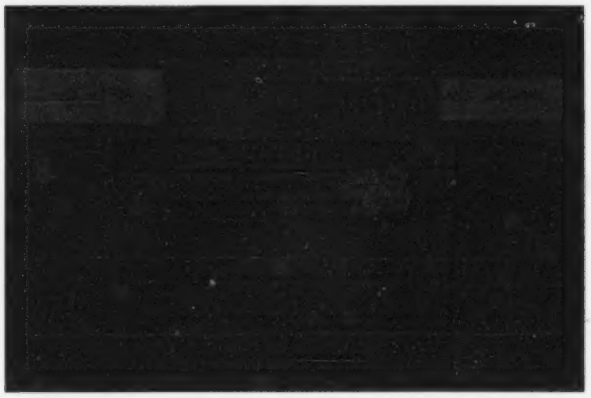
better ways of organizing and displaying the data and information being collected and mapped. Andre taught himself computer programming to build the tools he needed, which marked a change in his career as he moved away from geological mapping and into computer programming and data management.

Changes at the ARC resulted in Andre's transfer to the Alberta Geological Survey (AGS) Basin Analysis Group, for which he provided computing and data management expertise and developed several widely used mapping, administrative, and data management computer applications. These included the digital cartographic system used to produce many of the maps in the 1994 Geological Atlas of the Western Canada Sedimentary Basin. Andre served as the head of the AGS computing support group and eventually as leader of the Systems and Database Team.

In addition to these significant contributions, Andre shared his leading-edge vision for the future of digital geoscience. In the mid-1990s, he built the first AGS website, followed by a system to create and manage metadata about AGS' digital data products. The Alberta Township System coordinate converter tools that Andre



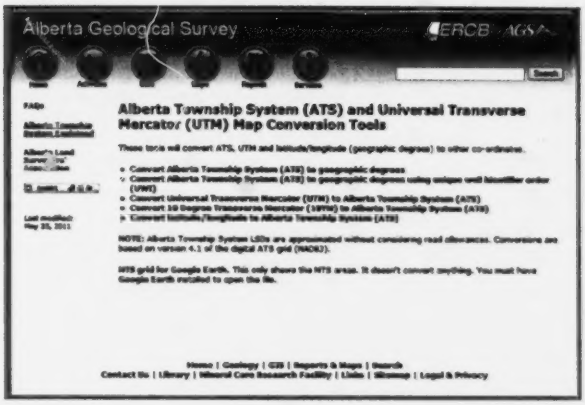
Geological Atlas of the Western Canada Sedimentary Basin.

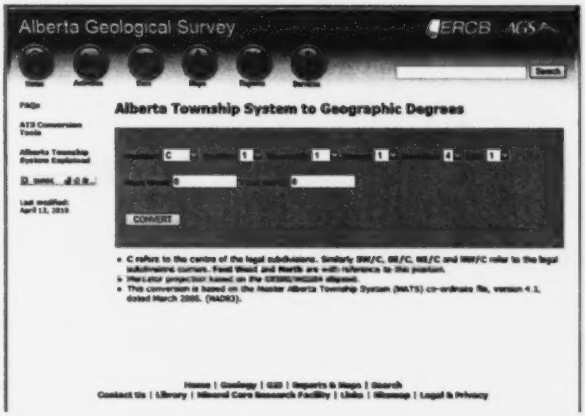


One of many boxes containing historical information that was recorded in Andre's data management program.

wrote for the AGS website continues to generate a large amount of traffic. Immediately following the publication of the Geological Atlas, Andre began to construct a basin framework model based on the digital grids and subcrop edges produced by the Atlas project.

Andre worked with the various AGS sections to provide them with expertise they required to help shape the sections' goals and visions, clearly articulating the need for careful and systematic data management and the value of computer-assisted methods to extract knowledge from those data. Andre's most recent work included helping build a consolidated table of formations for Alberta and contributing to a provincial geological framework to assist with the Energy Resources Conservation Board's science-based regulation of Alberta's energy development.


Alberta Geological Survey
ERCB AGS
Alberta Township System (ATS) and Universal Transverse Mercator (UTM) Map Conversion Tools




Alberta Township System coordinate converter tools at www.ags.gov.ab.ca/gis/map_converters/conversion_tools.html

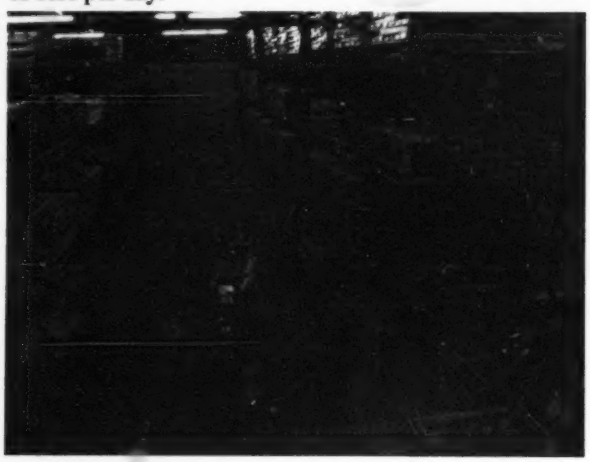
Andre's sudden passing was a shock to Alberta Geological Survey staff.

Although we weren't ready for Andre's passing, we can certainly remember his life and how he affected ours. Abraham Lincoln once said, "... in the end, it's not the years in your life that count. It's the life in your years." Andre was a private person, but through stories he or others would share, we know that Andre led an adventurous life. It seems fair to say that Andre's years were full of life. He will be deeply missed. ❖

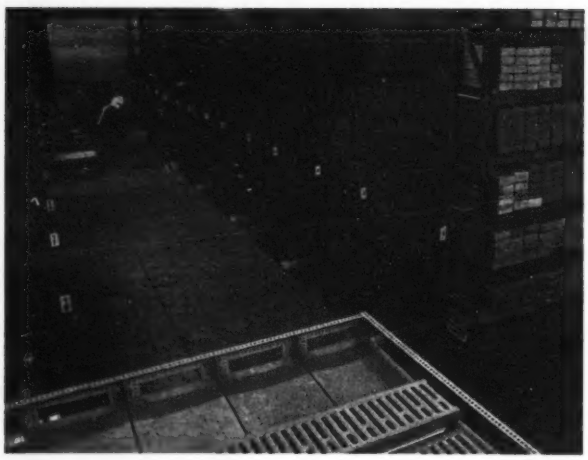
# Mineral Core Research Facility Revitalization Project Update

The Mineral Core Research Facility (MCRF) is undergoing a major facelift to create a special collection of core from key stratigraphic units, making it more accessible for clients and more efficient for Alberta Geological Survey (AGS) staff to locate, layout, and rack individual core. To achieve this, the core-storage and core-handling systems were remodelled after the system used by the Core Research Centre (CRC) in Calgary. The new racking system was installed in March 2011. This new core-storage system at the MCRF can hold about 100 kilometres of core.

Re-boxing started on July 4, 2011. Four core re-boxing stations were set up, and we re-boxed up to 120 metres of core per day.



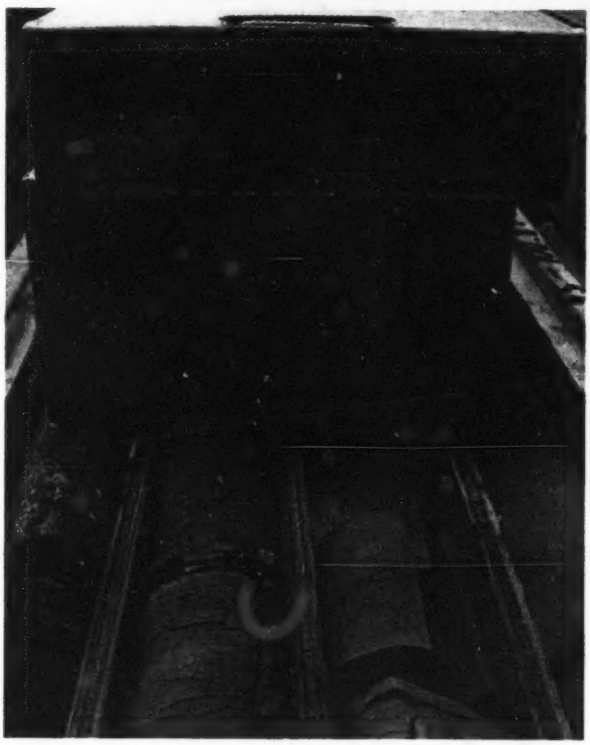
The MCRF in 2007.



The MCRF in November 2011 with the new storage racks in place.

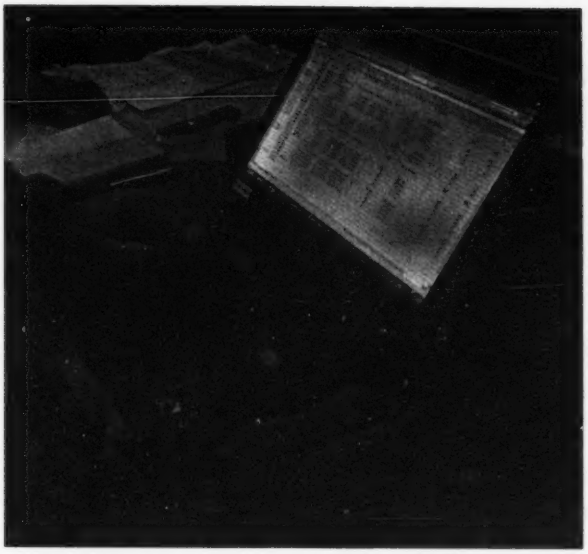
Cores were transferred from variously sized wooden and cardboard boxes to 76 cm long cardboard core boxes. Prior to re-boxing, we evaluated the cores' documentation, the completeness and quality of the core material, and the potential value for future investigations or the potential as reference material.

Before core is transferred into a new box, location information, core number, and core depth are recorded.

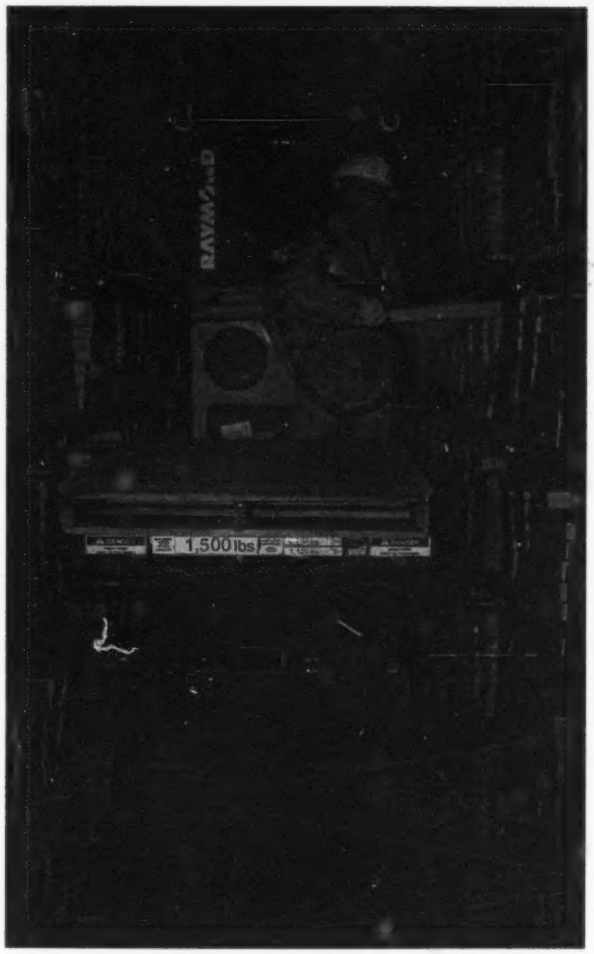


Prepared empty boxes ready for core.

Moving core to a new box can be challenging, particularly if the core is fractured.



All core information is stored in a database for tracking and analysis.




AGS staff member Rob Natyshen unloads newly boxed core to be studied by staff.

Preliminary recommendations allow prioritization of core for re-boxing. Cores without geographic location information, or of very poor quality, are not being re-boxed.

As of November, we have re-boxed 10 322 metres of core into 6164 cardboard core boxes. We expect to have all above-basement rock cores processed and installed into the new core-storage system by year's end. The total core moved by this time will be about 29 000 metres into about 15 500 cardboard core boxes.

In January 2012, we will evaluate and select the remaining 40 000 metres of basement-rock cores from northeastern Alberta, with an expected completion date of March 2013. Core not selected to remain in the AGS collection will be made available to the original company that donated the core. If a company has no interest in taking back the core, it will be offered to universities and colleges prior to disposal. Core will only be discarded as a last resort.

We would like to thank the ERCB staff at the CRC in Calgary, particularly, Kevin Kardelis and David Thorsell for recommendations regarding the core-storage system and core-handling equipment. Kevin and David also provided valuable input regarding core re-boxing procedures and techniques. ❖

## Recently Released Publications

### Bulletins

**BUL 065** Northern Alberta Kimberlite Province: The First 20 Years

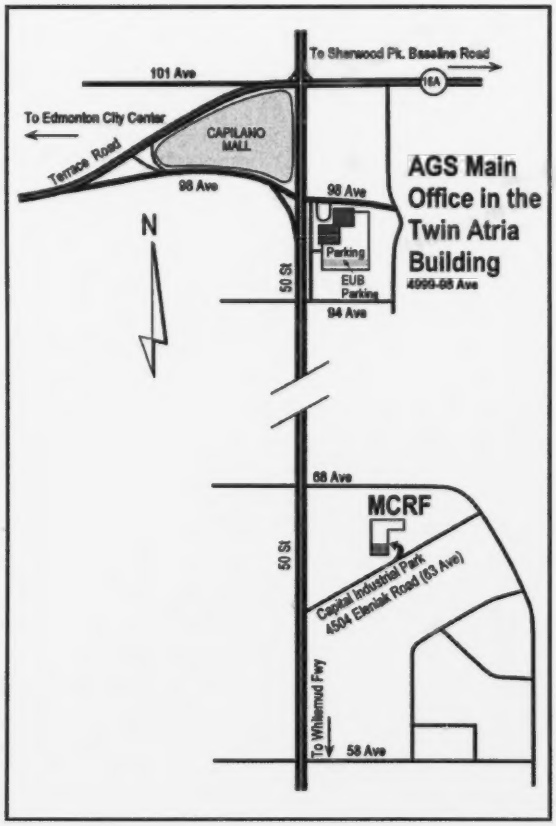
### Digital Datasets

**DIG 2011-0006** Subsurface Stratigraphic Picks for the Top of the Oldman Formation (Base of Dinosaur Park Formation), Alberta Plains (tabular data, tab-delimited format, to accompany Open File Report 2011-13)

**DIG 2011-0009** Surficial Geology of the Falher Area (NTS 83N/NW) (GIS data, polygon features)

**DIG 2011-0010** Surficial Geology of the Falher Area (NTS 83N/NW) (GIS data, line features)

**DIG 2011-0011** Surficial Geology of the Falher Area (NTS 83N/NW) (GIS data, point features)




### Information Series

**INF 139** Frank Slide and Turtle Mountain Early Warning System Technical Tour Guidebook (NTS 82G)

### Maps

**MAP 556** Surficial Geology of the Falher Area (NTS 83N/NW). Scale 1:100 000

### Open File Reports

**OFR 2011-11** Magmatism and Metallic Mineralization of the Rocky Mountain Fold-and-Thrust Belt, Southwestern Alberta (NTS 82G, 82H and 82J): Mineralogy, Geochemistry and Petrology of Selected Occurrences

**OFR 2011-13** Subsurface Stratigraphic Picks for the Top of the Oldman Formation (Base of Dinosaur Park Formation), Alberta Plains

**OFR 2011-15** Alberta Microseismicity Project, Phase I: Site Assessments for the ATSN Semipermanent Stations and the PSEIP Strachan Temporary Seismic Array

## AGS Locations

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For information on the MCRF or to book a visit, contact Rob Natyshen at (780) 466-1779 or Rob.Natyshen@ercb.ca